

## **MULTICODER™ MC-SCREEN**



## **User Guide V1.1**

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Document Version 1.1/130307

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## I. Information about the manual



This document is designed to help users setup, configure and work with the MC-SCREEN.

If you received this publication as a PDF, then it's a good idea to print it out for future reference.

It is best to use this user guide directly in front of your computer, by doing so you try out everything at once.

**!.** Important features are marked by this sign.

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# 1. Overview

MultiCoder™ is the product family name of a variety of live stream encoder and transcoder engines which are introduced below:

## MC-SCREEN:

MC-SCREEN encodes any local desktop- and screen-applications such as PowerPoint, Excel/Word, Websites including embedded video etc. MC-SCREEN supports HD-resolution for detailed reproduction of text, figures and fine details. It enables exclusive software encoding for usually installed PC's and laptops, without grabber card.

## MC-VGA/DVI:

MC-VGA/DVI encodes external desktop- and screen-signals such as PowerPoint, Excel/Word Websites including embedded video etc. with VGA/DVI input. MC-VGA/DVI supports HD-resolution for detailed reproduction of text, figures and fine picture textures. It has a VGA/DVI grabber card.

## MC-ENC:

Multiformat encoder and live stream transmitter with video and audio input. MC-ENC supports Composite (CVBS), Y/C, S-Video, SDI and Component (YUV) signals via different video grabber cards.

## MC-TRANS:

MC-TRANS enables transcoding and transrating of existing IPTV live streams. Allows stream modification and on-the-fly conversion of stream parameters: such as MPEG format, bitrate, bitrate type (CBR/VBR), resolution, GOP structure and much more.

## MC-ROUTE:

MC-ROUTE is an application for converting, routing and bridging different streaming types. It is designed for streaming to external locations, for WAN transmissions or for the adaptation and alignment of live streams within an IPTV system. Multiple live input streams can be modified to unicast, multicast or multiple unicast/multicast streams.

## 2. MC-SCREEN User Guide

This chapter gives you an overview over MC-SCREEN and demonstrates the software's main functions.

You need to install an application and configuring software. You can configure the application with the client software.

### 2.1 Accessing and Configuring MC-SCREEN

To start the application, you must go to the start menu and click to Programs > Teracue > Multicoder > MC-SCREEN > MC-SCREEN to open the main page of the MC-SCREEN, or simply start a shortcut called 'MC-SCREEN' on your desktop.

#### 2.1.1 Application startup

When you start the application a loading screen appears, see Figure 1. After the loading screen two icons appear at your desktop taskbar. The first one is the MC-SCREEN client icon and the second one is the MC-SREEN watchdog icon.



Figure 1: Application start screen

## 2.1.2 Watchdog of MC-SCREEN



**Figure 2:**  
Watchdog  
icon

If you double click on the watchdog icon at your taskbar, the 'Watchdog' window appears, see Figure 2. The watchdog application is running to guarantee stability of the MC-SCREEN. You can list the client process properties. See Figure 3: Watchdog window.

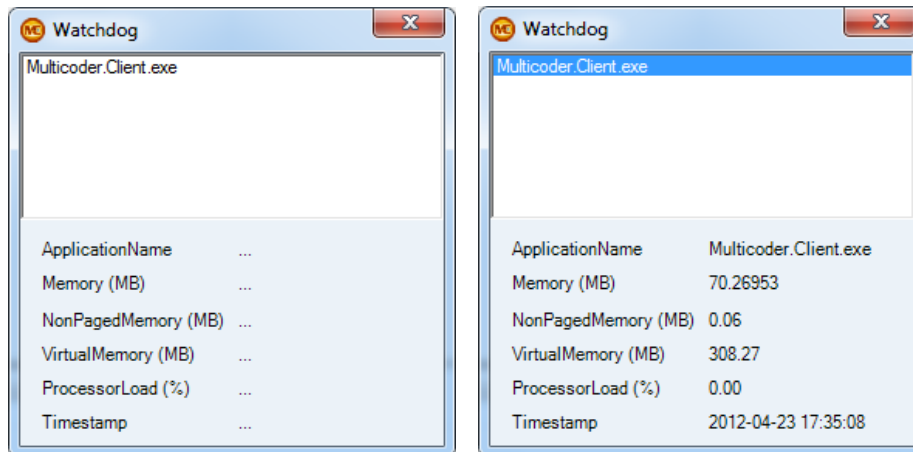


**Figure 3:** Watchdog window

## 2.1.3 MC-SCREEN Configuration



**Figure 4:**  
MC-SCREEN  
icon

You can open the graphical user interface of MC-SCREEN via the MC-SCREEN Client icon by making a double click on this icon.

### 2.1.3.1 ‘Apply’ / ‘Save’ Button

At all pages you have two options to save the settings. The first one is to click on the ‘Apply’ button see at Figure 5. In this case the settings will be set temporarily, so if you restart the application these settings will be lost, and the saved settings are loaded and shown. The other option is to save settings permanently via the ‘Save’ button. As this way the settings will keep also after restart.

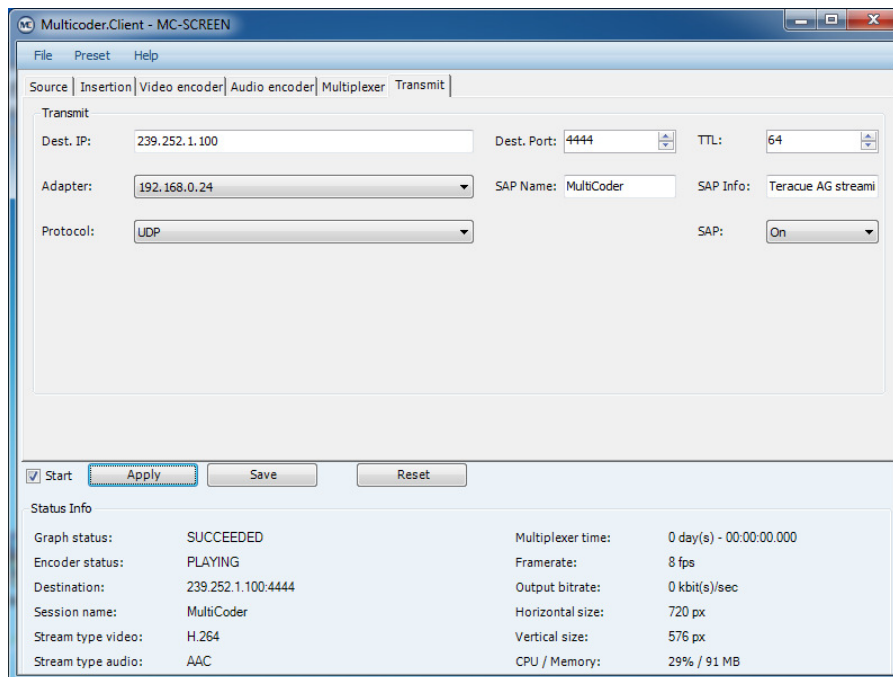


Figure 5: Save or Apply button

### 2.1.3.2 'Source' Tab Settings

As first step, you must specify which screen area shall be streamed. You can select the full screen mode ('Fullscreen' check box) or define a rectangle screen area with the 'X1', 'X2', 'Y1' and 'Y2' pixel points fields. In the 'Source' tab you can also set the audio source, the audio format and the frame rate ('FPS' field) of the stream.

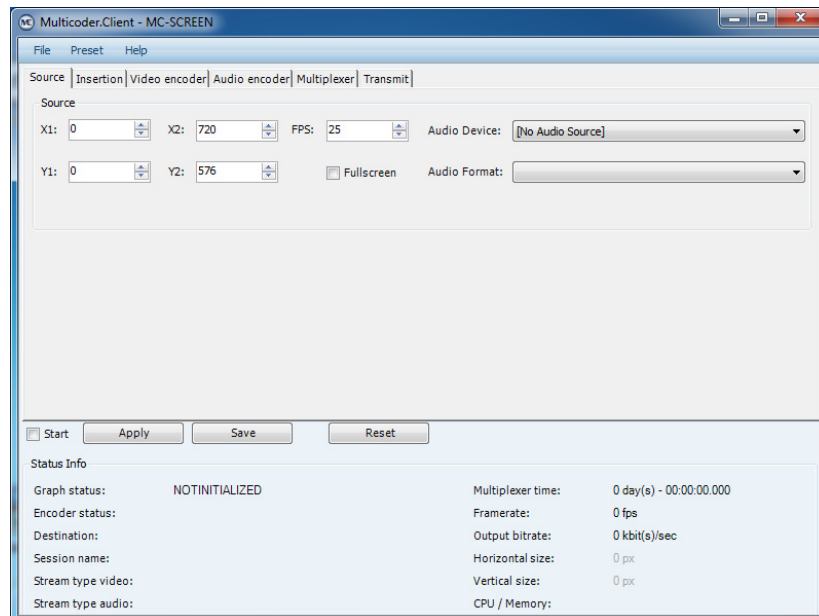


Figure 6: Source tab

### 2.1.3.3 'Insertion' Tab Settings

On this tab you can insert a text or an image to the streamed screen. You have three types to add: The bitmap-, text- and time-insertion. To use the inserter, you first have to enable the 'Use Inserter' check box.

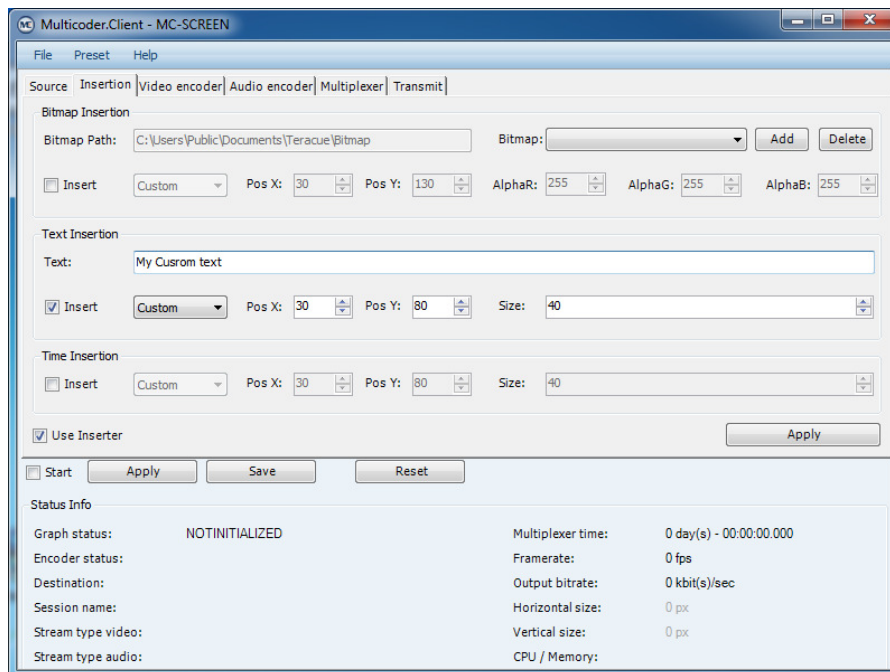


Figure 7: Text Insertion

#### Bitmap Insertion:

If you want to insert a bitmap (e. g. a logo) on the stream, you must enable the bitmap insertion check box. With the position mode drop down field you define whether the bitmap shall be inserted at a specific position ('Custom') or a general position (Top Left, Top Center, etc.). If you choose a specific position, you must also specify the accurate position of the picture with the 'Pos X', 'Pos Y' fields. You can set an alpha colour with the 'AlphaR' (red component), 'AlphaG' (green component) and 'AlphaB' (blue component) fields. This defined alpha color will be shown as transparent on the stream. At the Bitmap 'Add' button you can add new images to the list; the added pictures will be converted automatically to bmp files. With the 'Delete' button you can delete the current selected image from the list.

#### Text Insertion:

You can insert a custom text to the screen. See Figure 7. To do this, you must enable the text insertion check box. Then specify the custom text in the 'text' field, the font size of the text in the 'Size' field and the insertion position in the position mode drop down field and the 'Pos X', 'Pos Y' fields. With the position mode drop down field you define whether the text shall be inserted at a specific position ('Custom') or a general position (Top Left, Top Center, etc.). If you choose a specific position, you must also specify the accurate position of the text with the 'Pos X', 'Pos Y' fields.

#### Time Insertion:

To show the current time on the stream, you should enable the time inserter check box. The time format is YYYY-MM-DD HH:MM:SS. You can modify the size of the time text. With the position mode drop down field you define whether the time shall be inserted at a specific position ('Custom') or a general position (Top Left, Top Center, etc.). If you choose a specific position, you must also specify the accurate position with the 'Pos X', 'Pos Y' fields.

### 2.1.3.4 'Video encoder' Tab Settings

At video encoder tab settings you can choose the video encoding format. It can be MPEG2 or H264. Each format has its own settings which are described in Table 1.

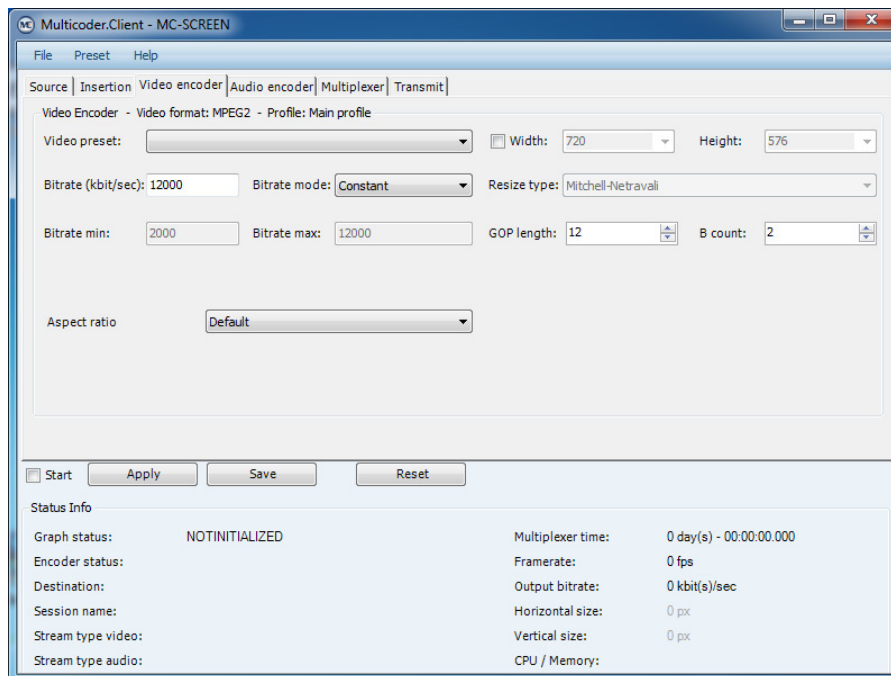


Figure 8: MPEG2 video settings

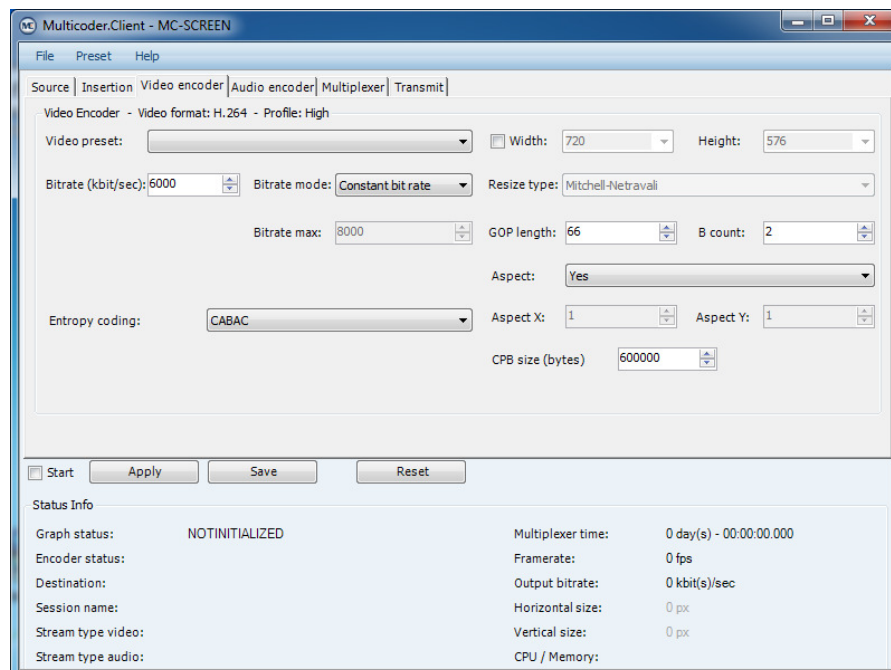


Figure 9: H264 video setting

| Settings:             | Description:                                                                                                                                                                                                                                                                                                                               |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Video preset:         | Specifies the output video format with the chosen profiles. Depending on the selected video format, the individual options, like 'Resolution', have different selectable variables.                                                                                                                                                        |
| Width:<br>Height:     | Specifies the video encoding resolution. The available resolutions depend on the chosen video format.                                                                                                                                                                                                                                      |
| Resize type:          | Only available, if you use custom resolution. <ul style="list-style-type: none"> <li>▪ B-Spline</li> <li>▪ Notch</li> <li>▪ Catmull-Rom spline</li> <li>▪ Mitchell-Netravali</li> </ul>                                                                                                                                                    |
| Bitrate (kbit/sec):   | Specifies the used video bitrate of the output stream.<br>For the case when you have chosen the variable bitrate as the bitrate mode: The 'Bitrate' field specifies the average bitrate. To set the maximum bitrate, you must use the 'Bitrate max' field.<br><b>..! The maximum bitrate is limited by the used MPEG-2 or H.264 level.</b> |
| Bitrate mode:         | Specifies the used bitrate mode of the output stream. You can switch between constant or variable bitrate. It modify the output bitrate what you can detect on the status info bar.                                                                                                                                                        |
| Bitrate min (kbit/s): | Specifies the used minimum bitrate of the output stream when variable bitrate mode is chosen.<br><b>..! The minimum bitrate is only available for MPEG-2.</b>                                                                                                                                                                              |
| Bitrate max (kbit/s): | Specifies the used maximum bitrate of the output stream when variable bitrate mode is chosen.<br><b>..! The maximum bitrate is limited by the used MPEG-2 or H.264 level.</b>                                                                                                                                                              |
| GOP length:           | The GOP is a group of successive pictures within a coded video stream. A GOP always begins with an I-frame. Afterwards several P-frames follow, in each case with some frames distance. In the remaining gaps are B-frames. A few video codec's allow for more than one I-frame in a GOP.                                                  |
| B count:              | Specifies the value of used B-frames.                                                                                                                                                                                                                                                                                                      |
| Entropy coding:       | Specifies the used entropy coding type CAVLC (Context-adaptive Variable Length Coding) or CABAC (Context-based Adaptive Binary Arithmetic Coding). This field appears only when H.264 is chosen in the 'Video preset' field.                                                                                                               |
| Aspect:               | Enables / Disables the aspect ratio usage.                                                                                                                                                                                                                                                                                                 |
| Aspect X:             | Specifies the aspect ratio in X coordinate.                                                                                                                                                                                                                                                                                                |
| Aspect Y:             | Specifies the aspect ratio in Y coordinate.                                                                                                                                                                                                                                                                                                |
| CPB Size (bytes):     | Specifies the size of the coded picture buffer (CPB). The buffer size will be changed automatically and depends at the entered bitrate. This field appears only when H.264 is chosen in the 'Video preset' field.<br><b>..! We recommend not changing the CPB buffer size.</b>                                                             |

Table 1: Video Encoder settings description

### 2.1.3.5 'Audio encoder' Tab Settings

To enable audio encoding, you must select an audio source at the 'Source' tab. Then you can choose in the 'Audio encoder' tab the encoding type which you want to use (MPEG2 or ACC). You can set the audio bitrate too. See Figure 10.

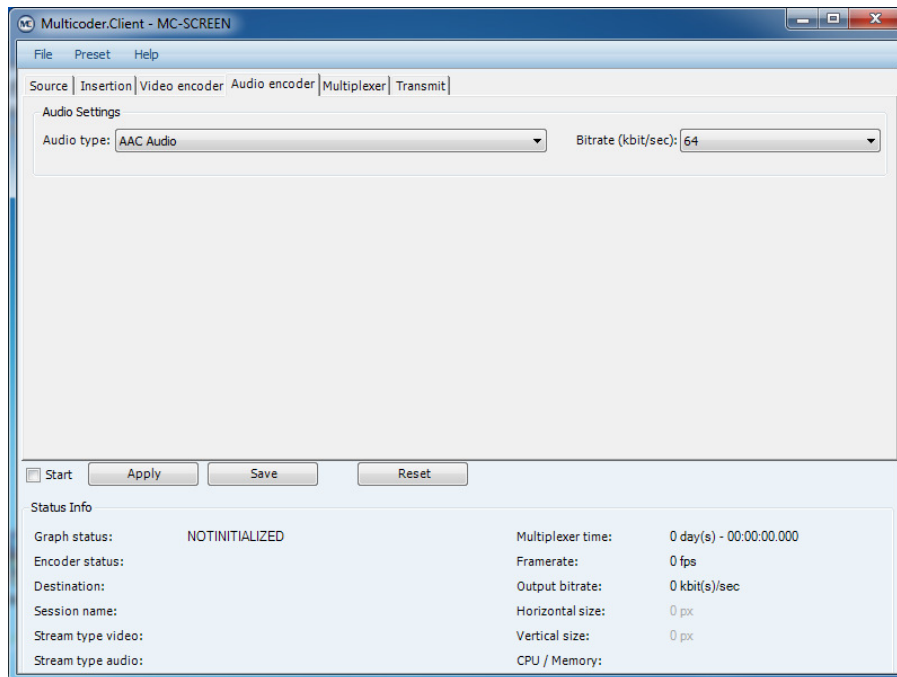


Figure 10: Audio settings

### 2.1.3.6 'Multiplexer' Tab Settings

On this page you can set the 'Enable padding' option to 'yes' or 'no'. The 'yes' option means that the stream packets will filled up, thus keep the bitrate at a constant level.

At the 'Video PID' and 'Audio PID' you can set them to a custom number.

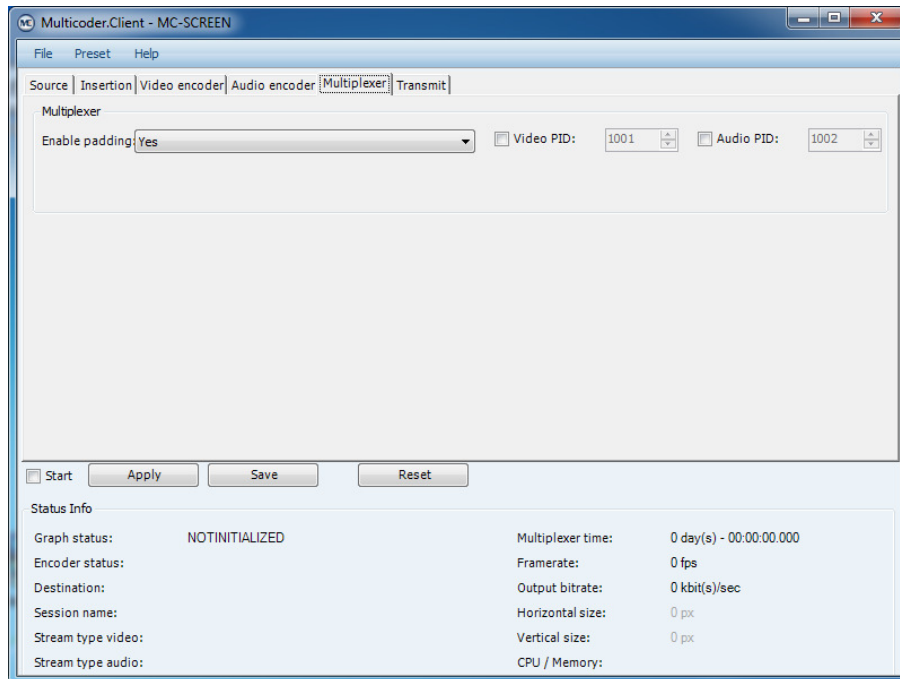


Figure 11: Multiplexer settings

### 2.1.3.7 'Transmit' Tab Settings

On this page you can set and specify where the stream shall be streamed.

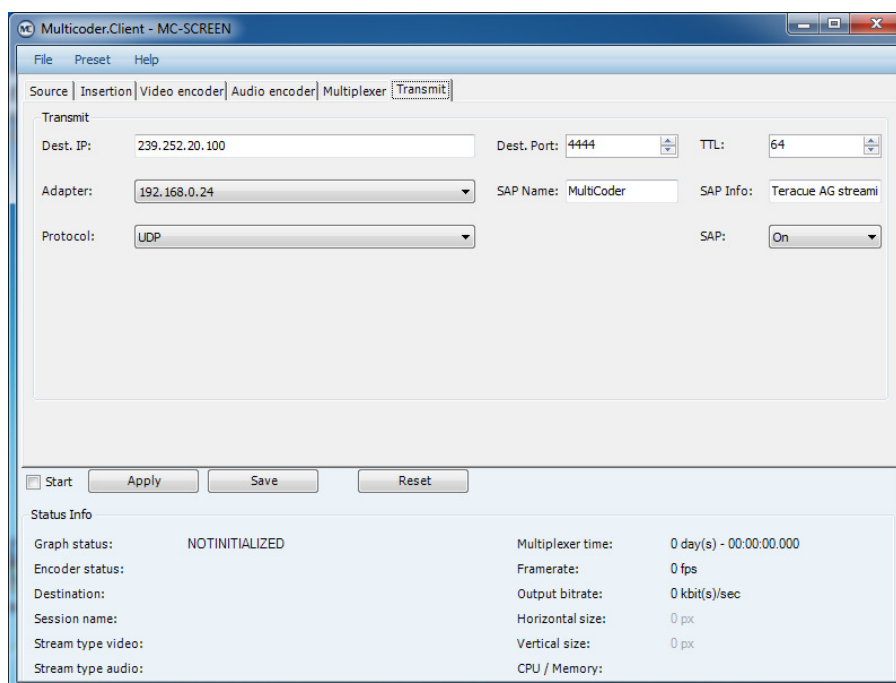


Figure 12: Transmit settings

| Settings:   | Description:                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dest. IP:   | Specifies the destination IP-address which should the MC-SCREEN use for the output stream.<br><u>If you want to stream a multicast stream:</u><br>Please enter in the IP-address field your desired multicast IP-address, e. g. 239.252.20.100.<br><u>If you want to stream a unicast stream:</u><br>Enter in the IP-address field the IP-address of the destination, e. g. the IP-address of a DEC-200™. |
| Dest. Port: | Specifies the port number of the output stream.                                                                                                                                                                                                                                                                                                                                                           |
| TTL:        | Specifies the number of routers/switches; how many routers/switches the stream is allowed to travel/pass.                                                                                                                                                                                                                                                                                                 |
| Adapter:    | Specifies the IP-address of the used network card in which the desired output stream will be sent. If several network ports are used, the MC-SCREEN lists all detected network port in this drop down field.                                                                                                                                                                                              |
| SAP Name:   | Specifies the session name of the stream which is attached in the SAP messages.                                                                                                                                                                                                                                                                                                                           |
| SAP Info:   | Specifies the description of your session.                                                                                                                                                                                                                                                                                                                                                                |
| Protocol:   | Specifies the stream mode protocol type. <ul style="list-style-type: none"> <li>UDP</li> <li>RTP over UDP</li> <li>transport RTP over UDP</li> </ul>                                                                                                                                                                                                                                                      |
| SAP:        | Here you can turn on/off the SAP message.                                                                                                                                                                                                                                                                                                                                                                 |

Table 2: Transmit settings description

### 2.1.3.8 Start/Stop Encoding Process and the Status Info Bar

Next the 'Apply' button you can find a 'Start' check box, with it you can start to grab your screen and to stream it into the network.

So enable the 'Start' check box and click on the 'Apply' or 'Save' button. Then the streaming starts. You can check the streaming status options on the status info bar. See Figure 13.

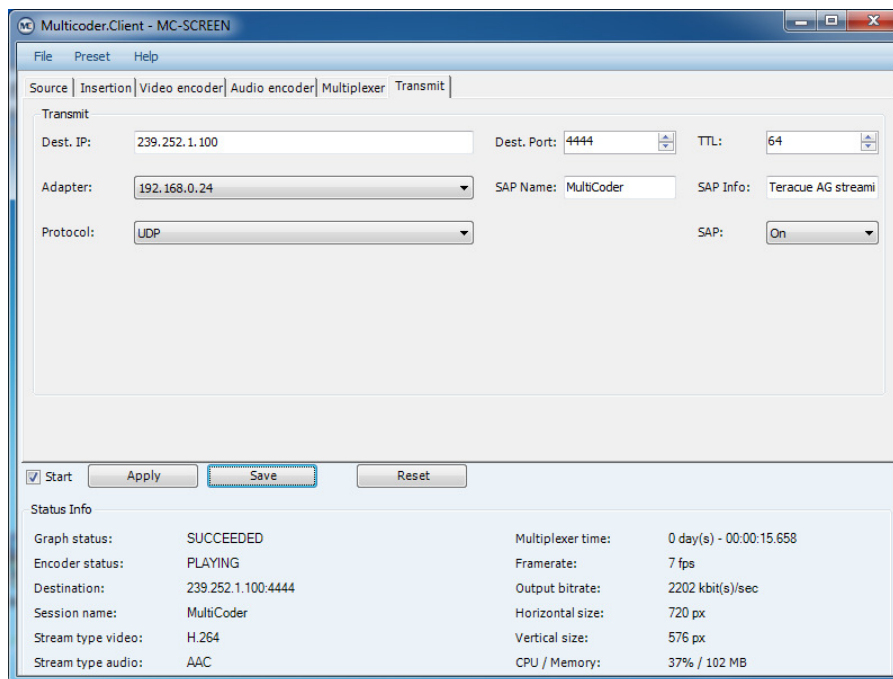


Figure 13: Status info bar

## 3. Video encoding guidelines

When you use the MultiCoder™, we recommend using the supplied presets. Please note: You can freely change all parameters in the advanced settings of the MultiCoder™, but some parameter combinations have possibly no function. To set correct parameters in the advanced settings of the MultiCoder™, you must have a good knowledge about the MPEG-2 and H.264 standard. For example, you use the 'Main Profile' and the 'Main Level' for a MPEG-2 encoding and you want to enter a bitrate of 20 Mbit/s. But the MPEG-2 standard restricts the maximum bitrate of the 'Main Level' to 15 Mbit/s, so you are not able to set the bitrate to 20 Mbit/s. You have set the MPEG-Level to 'High Level' to do so. The following chapters deliver a small insight of the MPEG-2 and H.264 standard guidelines.

### 3.1 MPEG-2 video guidelines

MPEG-2 supports different profiles and levels, which can be combined. The following tables shows the profile and level combinations (see Table 3), available picture types and chroma formats of the existing profiles (see Table 4), the maximum bitrates of profiles/levels (see Table 5) and the available frame rates (see Table 6):

|                 | Simple Profile | Main Profile | 4:2:2 Profile | High Profile |
|-----------------|----------------|--------------|---------------|--------------|
| High Level      | -              | ✓            | ✓             | ✓            |
| High 1440 Level | -              | ✓            | -             | ✓            |
| Main Level      | ✓              | ✓            | ✓             | ✓            |
| Low Level       | -              | ✓            | -             | -            |

Table 3: Profile and level combinations of MPEG-2

|               | Simple Profile | Main Profile | 4:2:2 Profile     | High Profile      |
|---------------|----------------|--------------|-------------------|-------------------|
| Picture type  | I, P           | I, P, B      | I, P, B           | I, P, B           |
| Chroma format | 4:2:0          | 4:2:0        | 4:2:0 or<br>4:2:2 | 4:2:0 or<br>4:2:2 |

Table 4: Available picture types and chroma formats of the MPEG-2 profiles

|                 | Simple Profile | Main Profile | 4:2:2 Profile | High Profile |
|-----------------|----------------|--------------|---------------|--------------|
| High Level      | -              | 80 Mbps      | 300 Mbps      | 100 Mbps     |
| High 1440 Level | -              | 60 Mbps      | -             | 80 Mbps      |
| Main Level      | 15 Mbps        | 15 Mbps      | 50 Mbps       | 20 Mbps      |
| Low Level       | -              | 4 Mbps       | -             | -            |

Table 5: Maximum video bitrates of MPEG-2 profiles/levels

The profiles and levels have also the following abbreviations:

**Profiles:**

Simple Profile → SP  
Main Profile → MP  
4:2:2 Profile → 422P  
High Profile → HP

**Levels:**

High Level → HL  
High 1440 Level → H144L  
Main Level → ML  
Low Level → LL

The usage of a specific profile with a specific level will be shown with a @-sign. For example: MP@ML means that you use the 'Main Profile' with the 'Main Level'.

|          | Resolution<br>W x H | Framerates in fps |    |    |       |    |    |       |    |            |       |    |
|----------|---------------------|-------------------|----|----|-------|----|----|-------|----|------------|-------|----|
|          |                     | Progressiv        |    |    |       |    |    |       |    | Interlaced |       |    |
|          |                     | 23,97             | 24 | 25 | 29,97 | 30 | 50 | 59,94 | 60 | 25         | 29,97 | 30 |
| MP@HL    | 1920x1088           | ✓                 | ✓  | ✓  | ✓     | ✓  |    |       |    | ✓          | ✓     | ✓  |
| MP@H144L | 1280x720            | ✓                 | ✓  | ✓  | ✓     | ✓  | ✓  | ✓     | ✓  |            |       |    |
|          | 1440x1088           | ✓                 | ✓  | ✓  | ✓     | ✓  |    |       |    | ✓          | ✓     | ✓  |
| MP@ML    | 704x480;<br>720x480 | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
|          | 704x576;<br>720x576 |                   | ✓  | ✓  |       |    | ✓  |       |    | ✓          |       |    |
|          | 640x480             | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
|          | 544x576             |                   | ✓  | ✓  |       |    | ✓  |       |    | ✓          |       |    |
|          | 544x480             | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
|          | 352x576             |                   | ✓  | ✓  |       |    | ✓  |       |    | ✓          |       |    |
|          | 352x480             | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
|          | 352x240             | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
| MP@LL    | 352x240             | ✓                 | ✓  |    | ✓     | ✓  |    | ✓     | ✓  |            | ✓     | ✓  |
|          | 352x288             |                   | ✓  | ✓  |       |    | ✓  |       |    | ✓          |       |    |

Table 6: MPEG-2: Available framerates by using the 'Main Profile' with different levels

## 3.2 H.264 guidelines

H.264 also known as MPEG-4 part 10 supports profiles and levels too. The profiles support different encoding criteria and the levels restrict the encoding parameters. See the Table 7 and the Table 8.

|                                    | Baseline Profile | Main Profile | High Profile |
|------------------------------------|------------------|--------------|--------------|
| I and P Slices                     | ✓                | ✓            | ✓            |
| B Slices                           | -                | ✓            | ✓            |
| SI and SP Slices                   | -                | -            | -            |
| Multiple Reference Frames          | ✓                | ✓            | ✓            |
| In-Loop Deblocking Filter          | ✓                | ✓            | ✓            |
| CAVLC Entropy Coding               | ✓                | ✓            | ✓            |
| CABAC Entropy Coding               | -                | ✓            | ✓            |
| Flexible Macroblock Ordering (FMO) | ✓                | -            | -            |
| Arbitrary Slice Ordering (ASO)     | ✓                | -            | -            |
| Redundant Slices (RS)              | ✓                | -            | -            |
| Data Partitioning                  | -                | -            | -            |
| Interlaced Coding (PicAFF, MBAFF)  | -                | ✓            | ✓            |
| 4:2:0 Chroma Format                | ✓                | ✓            | ✓            |
| 4:2:2 Chroma Format                | -                | -            | -            |
| 4:4:4 Chroma Format                | -                | -            | -            |
| 8 Bit Sample Depth                 | ✓                | ✓            | ✓            |
| 9 and 10 Bit Sample Depth          | -                | -            | -            |
| 11 and 12 Bit Sample Depth         | -                | -            | -            |
| 8x8 vs. 4x4 Transform Adaptivity   | -                | -            | ✓            |
| Quantization Scaling Matrices      | -                | -            | ✓            |
| Separate Cb and Cr QP control      | -                | -            | ✓            |
| Monochrome Video Format            | -                | -            | ✓            |
| Residual Color Transform           | -                | -            | -            |
| Predictive Lossless Coding         | -                | -            | -            |

Table 7: Supported criteria of H.264 profiles

Table 8 includes the following abbreviations for the word 'macro block' and for the word 'motion vector':

macro block → MB  
motion vector → MV

| Level | Max MB's/sec | Max Frame size (in MB's) | Max Bit rate for Baseline- and Main Profile | Max Bit rate for High Profile | Typical Frame Resolution | Typical Frame rate in fps | Max Reference Frames | Max MV's per two consecutive MB's |
|-------|--------------|--------------------------|---------------------------------------------|-------------------------------|--------------------------|---------------------------|----------------------|-----------------------------------|
| 1     | 1485         | 99                       | 64 kbps                                     | 80 kbps                       | 176x144                  | 15                        | 4                    | -                                 |
| 1.1   | 3000         | 396                      | 192 kbps                                    | 240 kbps                      | 176x144                  | 30                        | 9                    | -                                 |
|       |              |                          |                                             |                               | 320x240                  | 10                        | 3                    |                                   |
|       |              |                          |                                             |                               | 352x288                  | 7,5                       | 3                    |                                   |
| 1.2   | 6000         | 396                      | 384 kbps                                    | 480 kbps                      | 352x288                  | 15                        | 6                    | -                                 |
| 1.3   | 11880        | 396                      | 768 kbps                                    | 960 kbps                      | 352x288                  | 30                        | 6                    | -                                 |
| 2     | 11880        | 396                      | 2 Mbps                                      | 2,5 Mbps                      | 352x288                  | 30                        | 6                    | -                                 |
| 2.1   | 19800        | 792                      | 4 Mbps                                      | 5 Mbps                        | 352x480                  | 30                        | 6                    | -                                 |
|       |              |                          |                                             |                               | 352x576                  | 25                        |                      |                                   |
| 2.2   | 20250        | 1620                     | 4 Mbps                                      | 5 Mbps                        | 720x480                  | 15                        | 5                    | -                                 |
|       |              |                          |                                             |                               | 720x576                  | 12,5                      |                      |                                   |
| 3     | 40500        | 1620                     | 10 Mbps                                     | 12,5 Mbps                     | 720x480                  | 30                        | 5                    | 32                                |
|       |              |                          |                                             |                               | 720x576                  | 25                        |                      |                                   |
| 3.1   | 108000       | 3600                     | 14 Mbps                                     | 17,5 Mbps                     | 1280x720                 | 30                        | 5                    | 16                                |
| 3.2   | 216000       | 5120                     | 20 Mbps                                     | 25 Mbps                       | 1280x720                 | 60                        | 4                    | 16                                |
| 4     | 245760       | 8192                     | 20 Mbps                                     | 25 Mbps                       | 1920x1088                | 30                        | 4                    | 16                                |
|       |              |                          |                                             |                               | 1280x720                 | 60                        |                      |                                   |
| 4.1   | 245760       | 8192                     | 50 Mbps                                     | 62,5 Mbps                     | 1920x1088                | 30                        | 4                    | 16                                |
|       |              |                          |                                             |                               | 1280x720                 | 60                        |                      |                                   |
| 4.2   | 491520       | 8192                     | 50 Mbps                                     | 62,5 Mbps                     | 1920x1088                | 60                        | 4                    | 16                                |
| 5     | 589824       | 22080                    | 135 Mbps                                    | 168,75 Mbps                   | 2048x1024                | 72                        | 5                    | 16                                |
| 5.1   | 983040       | 36864                    | 240 Mbps                                    | 300 Mbps                      | 2048x1024                | 120                       | 5                    | 16                                |
|       |              |                          |                                             |                               | 4096x2048                | 30                        |                      |                                   |

Table 8: Restrictions of H.264 levels

## 4. Audio encoding guidelines

### 4.1 MPEG-1 and MPEG-2 audio guidelines

| MPEG-Version: |           | Sample rates in kHz: |                    |                    |                    |                    |                    |
|---------------|-----------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|               |           | 16                   | 22,05              | 24                 | 32                 | 44,1               | 48                 |
| MPEG-1        | Layer I   | -                    | -                  | -                  | 32 – 448<br>kBit/s | 32 – 448<br>kBit/s | 32 – 448<br>kBit/s |
|               | Layer II  | -                    | -                  | -                  | 32 – 384<br>kBit/s | 32 – 384<br>kBit/s | 32 – 384<br>kBit/s |
|               | Layer III | -                    | -                  | -                  | 32 – 320<br>kBit/s | 32 – 320<br>kBit/s | 32 – 320<br>kBit/s |
| MPEG-2        | Layer I   | 32 – 256<br>kBit/s   | 32 – 256<br>kBit/s | 32 – 256<br>kBit/s | -                  | -                  | -                  |
|               | Layer II  | 8 – 160<br>kBit/s    | 8 – 160<br>kBit/s  | 8 – 160<br>kBit/s  | -                  | -                  | -                  |
|               | Layer III | 8 – 160<br>kBit/s    | 8 – 160<br>kBit/s  | 8 – 160<br>kBit/s  | -                  | -                  | -                  |

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